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Kingsley

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(54) **STOPE FILL BARRIER**

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CPC ***E21F 15/04*** (2013.01); ***E21C 41/16*** (2013.01)

(58) **Field of Classification Search**
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See application file for complete search history.

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(57) **ABSTRACT**

A system for mining includes the use of a stope fill barrier having a fluid-fillable bladder for temporarily filling a portion of a stope void directly adjacent to ore to be mined and creating a barrier between the stope void and adjacent ore. The stope fill barrier is installed and positioned in the stope void from below the adjacent ore.

11 Claims, 3 Drawing Sheets

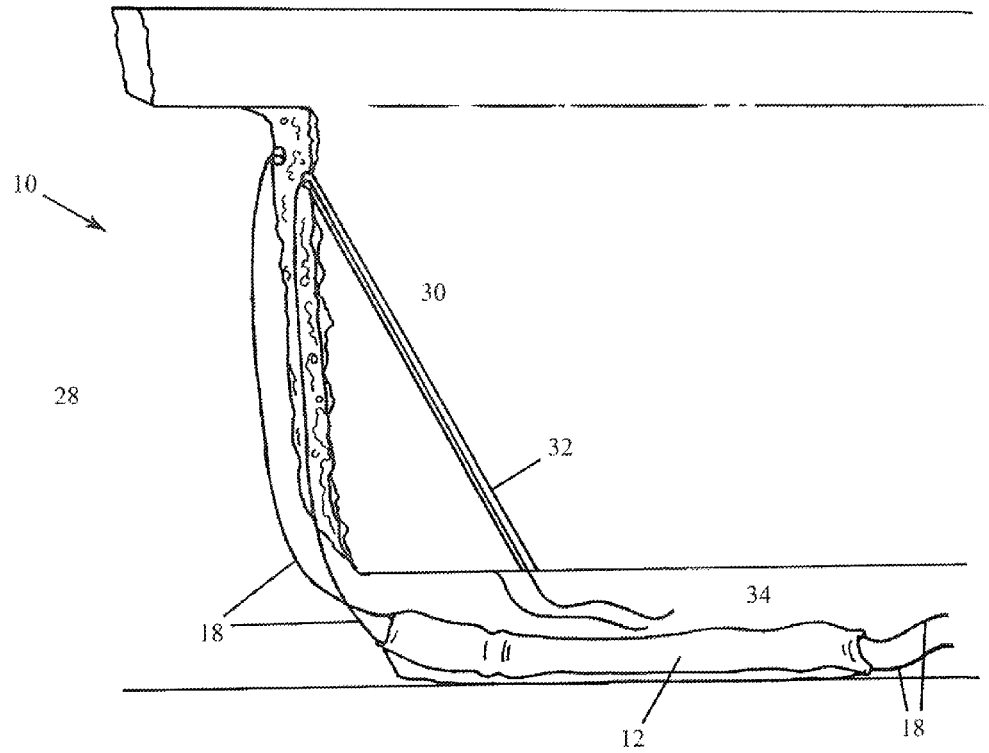


Figure 1

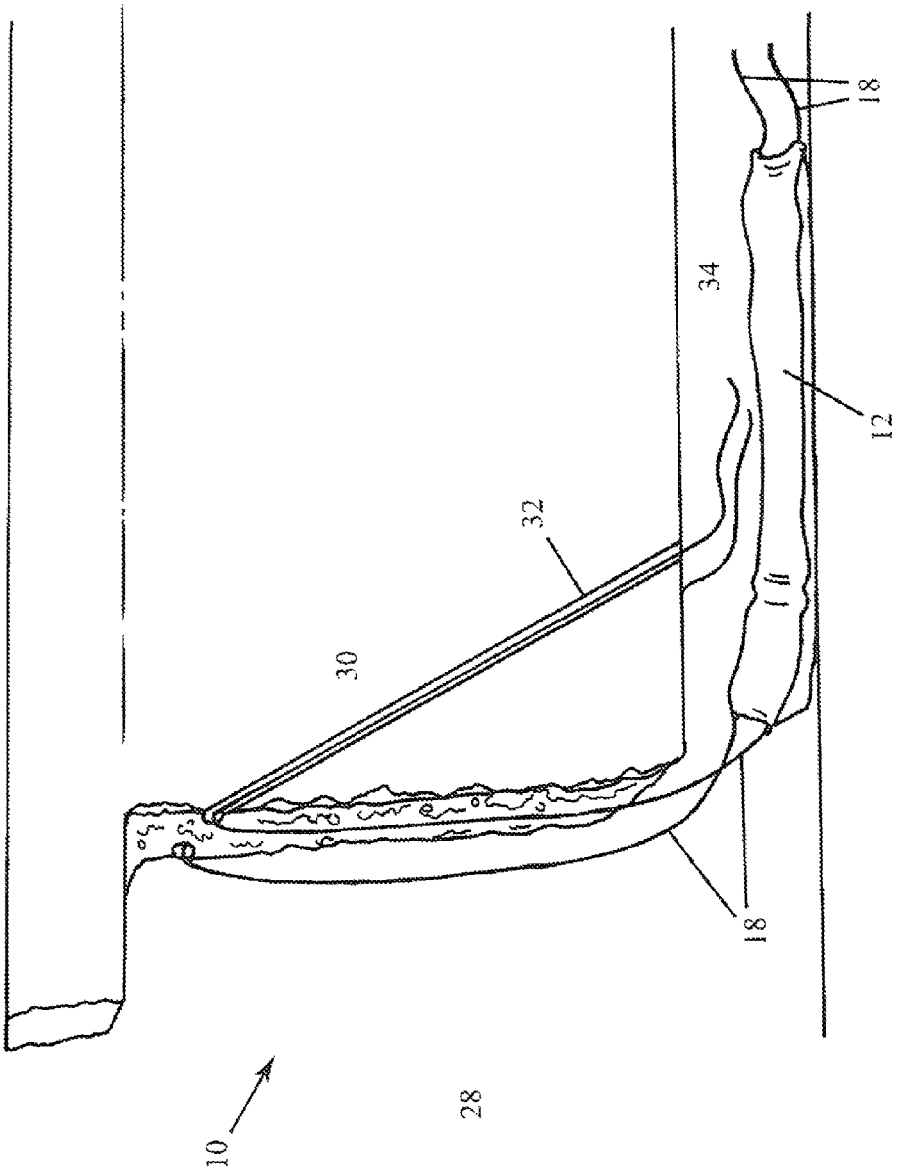
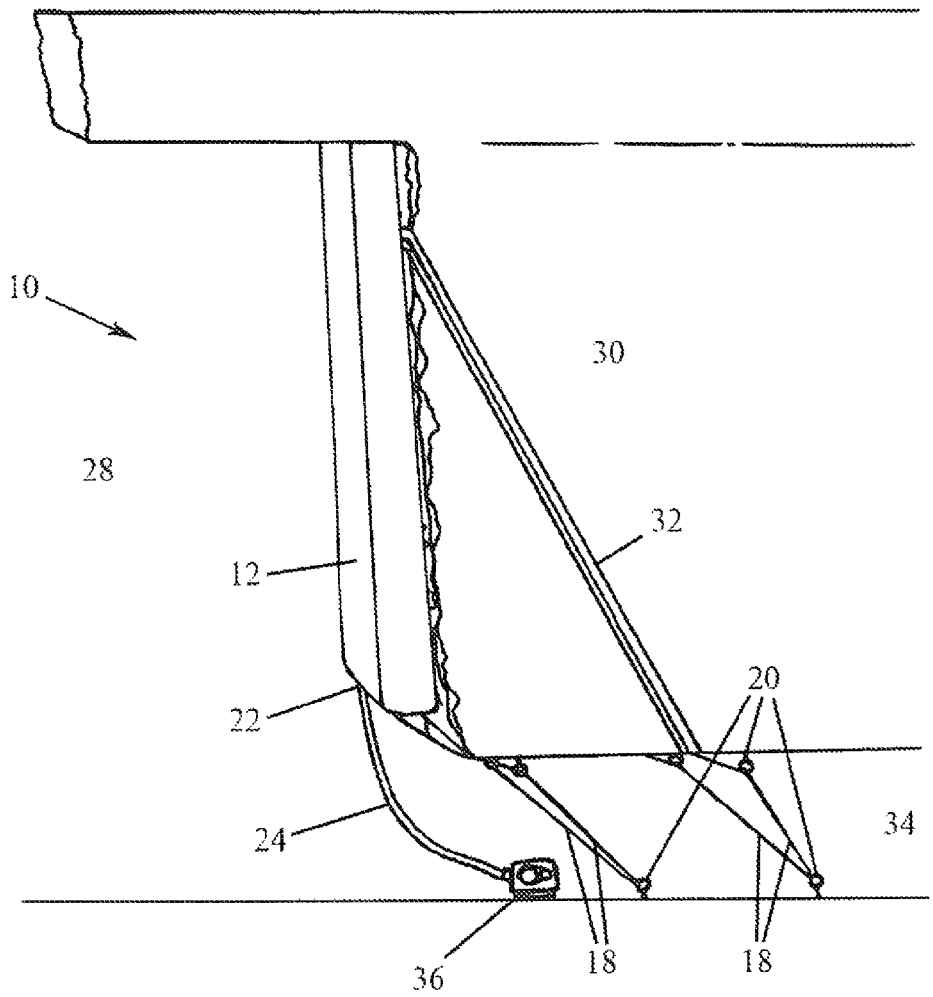


Figure 2



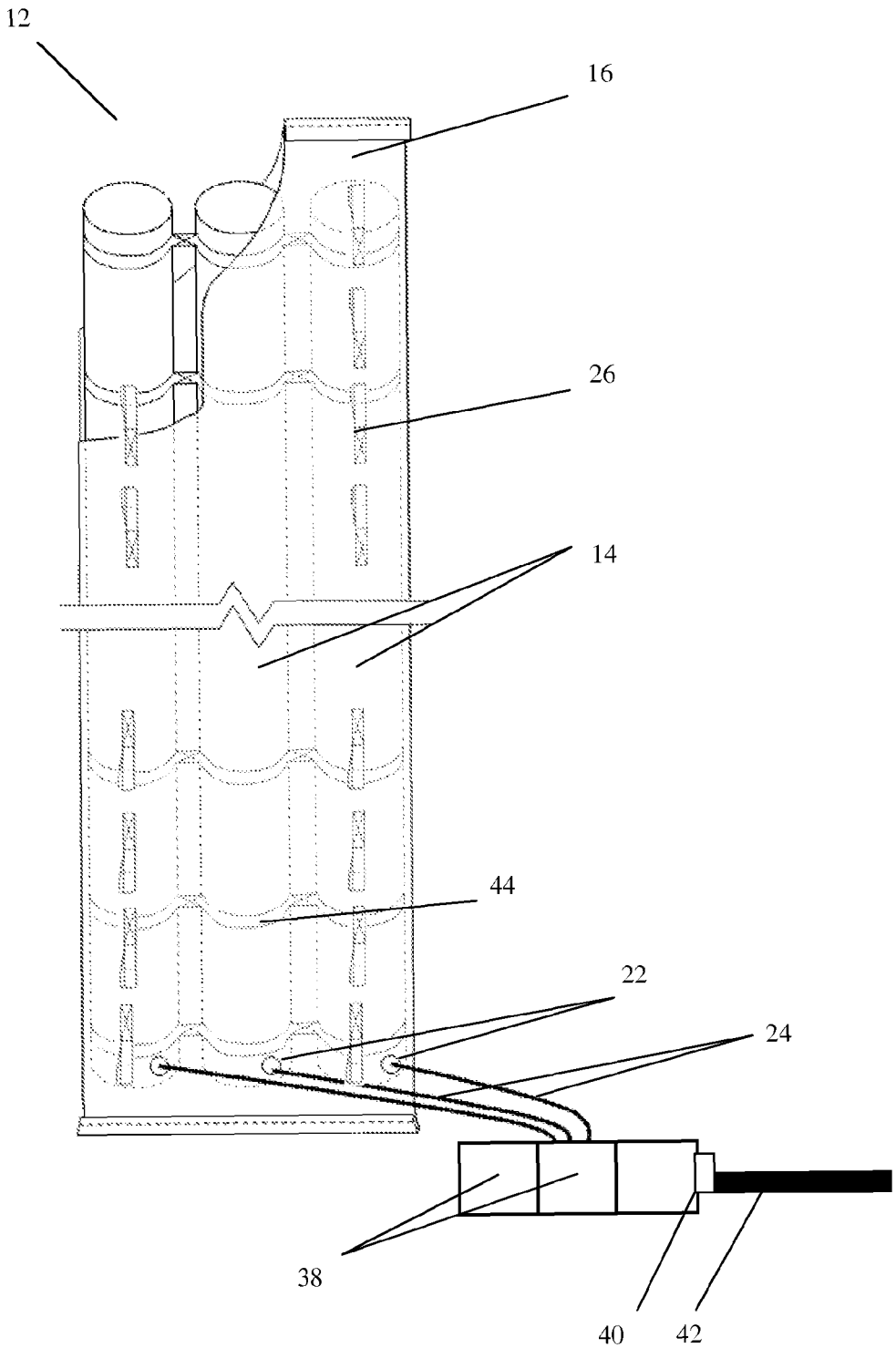


Figure 3

STOPE FILL BARRIER

FIELD OF THE INVENTION

The present invention relates to a stope fill barrier.

BACKGROUND

Frequently, valuable minerals are naturally occurring in ore bodies located in subterraneous deposits. Due to the location of these deposits, often far beneath the surface of the earth and within hard rock, methods of mining to remove them are required.

A modern and presently used method for underground mining entails the removal of ore from a panel of rock, known as a stope. The stope is accessible via an access drive cut into the earth in the level below the ore body to be mined The rock and ore of the stope are fragmented and removed using explosives and once the area has been mined, a stope void remains. This space cannot be left within the ground and, as such, the void is backfilled to fill the created underground space.

Rock must be fragmented by blasting operations to enable its collection and removal from a mine Fragmented rock needs to expand into additional space due to its increased volume. Once a stope void has been backfilled, all space has been removed. Hence subsequent ore collection operations are delayed by the need for creating space blasted rock fragments. Commonly, slot rise holes are drilled up from the access drive, in the ore adjacent to the backfilled stope. These holes provide the necessary space for expanded rock. Explosives are then used to fragment the rock which enables its removal. The drilling of slot rise holes into which blasted rock is allowed to expand is both costly and time-consuming.

The present invention attempts to overcome at least in part the aforementioned disadvantages of previous methods of mining.

SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention there is provided a system for mining comprising the use of a stope fill barrier having a fluid-fillable bladder for temporarily filling a portion of a stope void directly adjacent to ore to be mined and creating a barrier between the stope void and adjacent ore, wherein the stope fill barrier is installed and positioned in the stope void from below the ore.

The stope fill barrier may be installed and positioned from an access drive beneath the ore to be mined

The stope fill barrier may be installed and positioned from an access drive beneath the ore to be mined and a shaft may be drilled from between an upper surface of the access drive and the stope void for the stope fill barrier to be installed from.

An end of the shaft at the stope void may be located proximal to a top of the ore.

The portion of the stope void filled by the stope fill barrier may be between 50% and 100% of a length between a top of the stope void and a lower surface of the ore.

The bladder may be filled with fluid subsequent to installation.

The stope void may be backfilled with the stope fill barrier installed within the stope void.

The stope fill barrier may be anchored in place using tensioned ropes or cables fixed to anchor points below the ore.

The fillable bladder may be in connection with at least one pressure regulator to maintain pressure of the fluid-filled bladder.

The fluid-filled bladder may be capable of holding fluid pressures of between 0.5 psi and 50 psi.

The bladder may be made from a hard-wearing, heavy duty, puncture resistant material.

The bladder may comprise a plurality of bladders contained within an outer bag.

The bladder may be arranged to be inflated with air.

BRIEF DESCRIPTION OF DRAWINGS

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. **1** is a perspective view of a system for using a stope fill barrier according to a preferred embodiment of the present invention in an installed, filled position;

FIG. **2** is a perspective view of the system of FIG. **1** in an un-installed, unfilled position; and

FIG. **3** is a perspective, partly cut away view of the bladder of a stope fill barrier according to a preferred embodiment of the present invention connected with a schematic view of a filling means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1** and **2**, there is shown a system for temporarily filling a vertical part of a stope void **28** directly adjacent to ore to subsequently be mined, or stope **30**, comprising the use of a stope fill barrier **10** comprising a fillable bladder **12** for filling part of the stope void **28** and creating a barrier between the void **28** and adjacent ore **30**, wherein the stope fill barrier **10** is installed and positioned in the stope void **28** from below the stope **30**, such as from an access drive **34**, in accordance with the present invention.

The stope fill bather **10** comprises a connection **22** adapted for coupling with fluid lines **24** connected to a filling means **36**. The stope fill barrier **10** further comprises ropes or cables **18** which, in use, facilitate the installation and positioning of the stope fill barrier **10**. In accordance with a preferred embodiment of the present invention, at least two ropes or cables **18** may be connected with a lower end of the bladder **12** and at least two ropes or cables may be connected with an upper end of the bladder **12**.

In accordance with the system of the present invention, anchor points **20**, for example eye bolts, are provided on the access drive **34**. In a preferred embodiment, at least two anchor points **20** are provided respectively on an upper surface and a lower surface of the access drive **34**. At least one access shaft **32** is provided between the access drive **34** and the stope void **28**. Preferably, the access shaft **32** is drilled from below in a diagonal from the upper surface of the access drive **34** remote from the stope void **28** to the stope void at an upper region of the next stope **30**.

With reference to FIG. **3**, in accordance with a preferred embodiment of the present invention, the fillable bladder **12** comprises a plurality of inner bladders **14**. The inner bladders **14** are contained within an outer bag **16**. The outer bag **16** is preferably made from a wear and scuff-resistant material. More preferably, the outer bag **16** is made from a hard-wearing, heavy duty material.

Cable attachment points **26** are provided on the outer bag **16** of the bladder **12**. In accordance with a preferred embodiment, the cable attachment points **26** are provided as loop handles. Preferably, the attachment points **26** are spaced at intervals between 100 millimetres (mm) and 1 metre (m), more preferably at about 500 mm intervals on both sides of

one face of the bladder **12**. The attachments points **26** are provided for a length of between 1 m and 10 m, preferably about a 5 m length at both an upper and lower end of the bladder **12**.

In accordance with an additional embodiment of the present invention, the cable attachment points **26** may be provided as a continuous line, for example, a steel cable. The steel cable may be sewn or otherwise suitably attached to the fabric of the outer bag **16**. The steel cable then allows for anchoring of additional ropes or cables **18** at varying points along the length of the bladder **12** thereby serving as cable attachment points **26**.

Each inner bladder **14** comprises a connection **22** to facilitate coupling with the fluid lines **24** to enable filling of the inner bladders **14**. In a preferred embodiment, the inner bladders **14** are capable of holding fluid pressures between 0.5 psi and 50 psi, preferably between 10 psi and 30 psi. Reinforcement banding **44** is provided on the inner bladders **14** which may allow for even filling of the inner bladders **14**.

The fluid lines **24** connect with pressure regulators **38**. Preferably, one pressure regulator is provided for each one fluid line **24** for each inner bladder **14**. In use, the pressure regulators **38** maintain the requisite pressure of each of the inner bladders **14**. At least one hose **42** is connected with the pressure regulators **38** through a coupling **40**. Fluid for filling the inner bladders **14** is provided through the hose **42**.

In use, an ore body to be mined, or stope **30**, is provided underground. Using methods and techniques known in the art, an access drive **34** is provided beneath the stope **30**. A stope void **28** is present adjacent to the stope **30** from previous mining activities.

In order to access the stope void for installation of the stope fill barrier **10**, at least one access shaft **32** is drilled from the upper surface of the access drive **34**, through the stope **30** to break through to the stope void **28** near the top of the stope **30**. The shaft **32** may be drilled from below by a typical longhole drill and may be variable in diameter, preferably from 64 mm to 150 mm.

Ropes or cables **18** are placed within the access drive **34** end of the shaft **32** and are made to travel to the stope void **28** end of the shaft **32**. The ropes or cables **18** are fed, lifted or pushed through the shaft **32** in any manner suitable for moving them to the required position.

The ropes or cables **18** are fed through the shaft **32** and allowed to fall from the stope **30** until they are within reach of the level of the access drive **34**. The ropes or cables **18** are then retrieved from their position within stope void **28** to be pulled into the access drive **34**. In a preferred embodiment, the ropes or cables **18** are retrieved using a pole and hook arrangement, operable from within the access drive **34**. The pole is used to reach the ropes or cables **18** and the hook used to grab them. In another embodiment, the ropes or cables may be accessed using a vehicle driven into the stope void **28** to retrive the ropes or cables **18** and transport them to the access drive **34**. The vehicle may be remotely operable.

The stope fill barrier **10** of the present invention is provided in the access drive **34** in preparation for installation. The ends of the ropes or cables **18** which have travelled through the shaft **32** are then attached to the stope fill barrier **10** in accordance with the present invention. Attachment points **26** are utilised for connection with the ropes or cables **18**. The selection of suitable attachment points **26** is made for a resultant desired height of the bladder **12** relative to the end of the shaft **32** within the stope void **28**. For example, if it is desired to have the top of the bladder **12** at the same height as that of the end of the shaft **32** in the stope void **28**, then an attachment point **26** at the upper end of the bladder **12** would be used. If it is desired to have the top of the bladder **12** two metres higher than the end of the shaft **32** in the stope void **28**, then an attachment point **26** two metres below the top of the bladder **12** would be utilised for connection with the ropes or cables **18**.

Following connection of the ropes or cables **18** to the stope fill barrier **10**, the bladder **12** is hoisted into position in the stope void **28** adjacent the stope **30**. Any suitable method may be used for hoisting, such as manually or using a mechanical winch or pulling with a vehicle.

A further at least two ropes or cables **18** are attached to the lower end of the bladder **12**. The at least two ropes or cables **18** at both the upper and lower ends of the bladder **12** are tensioned so that the bladder **12** is positioned firmly and restrained in a desired location between the stope void **28** and the adjacent stope **30**. The ropes or cables **18** are tensioned with any suitable tensioning device or method and anchored to the anchor points **20**. The lower end of the bladder **12** may be level with, above or below the level of the upper surface of the access drive **34**.

Once the bladder **12** is in position and anchored, one end of each fluid line **24** may be coupled with a respective connection **22** on the inner bladders **14**. A second end of each fluid line **24** may be connected with the corresponding pressure regulator **38**, which is, in turn, connected with a hose **42** through a coupler **40**. Fluid, for example mine air, is then brought from the hose through to fill the inner bladders **14** up to and kept at a required pressure by the pressure regulators **38**.

With the stope fill barrier **10** in place to temporarily fill a portion of the stope void **28**, the remainder of the stope void **28** may be backfilled according to normal and known methods. In a preferred embodiment, the portion of the stope void **28** filled by the stope fill barrier **10** is between about 50% and 100%, more preferably about 75% to 95% of the length between a top of the stope void **28** and an upper surface of the access drive **34**.

After the filled stope void **28** has cured, the stope fill barrier **10** is preferably emptied and disconnected from the fluid lines **24** and filling means. The ropes or cables **18** may be removed from the anchor points **20** and the stope fill barrier uninstalled. In a second embodiment, the stope fill barrier **10** may remain in the backfill or be destroyed by subsequent blasting and mining operations.

The created space, from which the stope fill barrier **10** has been uninstalled, provides a relief void for subsequent blasting operations or removes the need for holes to be drilled in the next ore stope **30** and subsequent mining can commence immediately.

Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

The invention claimed is:

1. A system for mining comprising the use of a stope fill barrier having a fluid-fillable bladder for temporarily filling a portion of a stope void directly adjacent to ore to be mined and creating a barrier between the stope void and adjacent ore, wherein the stope fill barrier is installed and positioned in the stope void from an access drive beneath the ore to be mined and wherein the system further comprises a shaft which is drilled from between an upper surface of the access drive to the stope void for the stope fill barrier to be installed from.

2. A system according to claim **1**, wherein an end of the shaft at the stope void is located proximal to a top of the ore.

3. A system according to claim 1, wherein the portion of the stope void filled by the stope fill barrier is between 50% and 100% of a length between a top of the stope void and a lower surface of the ore.

4. A system according to claim 1, wherein the bladder is filled with fluid subsequent to installation.

5. A system according to claim 1, wherein the stope void is backfilled with the stope fill barrier installed within the stope void.

6. A system according to claim 1, wherein the stope fill barrier is anchored in place using tensioned ropes or cables fixed to anchor points below the ore.

7. A system according to claim 1, wherein the bladder is in connection with at least one pressure regulator to maintain pressure of the fluid-filled bladder.

8. A system according to claim 1, wherein the fluid-filled bladder is capable of holding fluid pressures of between 0.5 psi and 50 psi.

9. A system according to claim 1, wherein the bladder is made from a hard wearing, heavy duty, puncture resistant material.

10. A system according to claim 1, wherein the bladder comprises a plurality of bladders contained within an outer bag.

11. A system according to claim 1, wherein the bladder is arranged to be inflated with air.

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